

REMARKS

Reconsideration and allowance of this application, as amended, are respectfully requested. Claims 10, 13, 16, and 26 have been amended. Claims 10, 13-16, and 26 are now pending in the application. The rejections are respectfully submitted to be obviated in view of the amendments and remarks presented herein.

In the present Amendment, claims 10 and 16 have been amended to more specifically define the steps in the claimed method. Most notably, claims 10 and 26 have been amended to further include the step of "expelling the gaseous coolant" through slots in the face of the chuck.

Thus, in the claimed invention the chuck is cooled during plasma etching by communicating a coolant gas through a hollow shaft. The coolant gas is then maintained in a coolant chamber, defined as the area between the chuck and pedestal; and upon completion of the etching, the gas is expelled through slots in the chuck.

During the etching process, the gaseous coolant does not leave the coolant chamber. The gaseous coolant cannot flow back out through the hollow shaft because pressurized coolant is communicated through the hollow shaft throughout the etching process. It is only after the etching process, when the hollow shaft (the hollow lift rod

102b) and the spider 102a move the wafer vertically upward to an unloading position, that the gaseous coolant can exit through the plurality of slots 16a formed in the face of the chuck. (See the disclosure at specification page 10, lines 8-22, and the depiction of the slots 16a in Fig. 1).

Additional support for these amendments can be found in the specification, pages 10-11 and in Figs. 1-3. Entry of these amendments is respectfully requested.

35 U.S.C. § 102(b) or 103(a) – Helms

Claims 10, 16 and 26 stand rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over, U.S. Patent No. 4,869,801 to Helms et al. (hereinafter “Helms”). Claim 13 stands rejected under 35 U.S.C. § 103(a) as obvious over Helms. The Office Action asserts, *inter alia*, that “[a]n embodiment represented in Fig. 4 of Helms and described in detail in col. 4 lines 13+ anticipates the present invention.” In describing Helms’ disclosure, the Office Action also asserts that “[t]he wafer is placed on a chuck plate which is coupled to a pedestal with a central hollow shaft” and that “the hollow cooled shaft of the pedestal (Fig. 4, 45) moves in response to actuation of the wafer lift mechanism.” While conceding that “it is unclear if the cooling medium is limited to only a liquid which must be stationary during the process,” the

Office Action concludes that, "it would have been obvious. . . to use a gas coolant since Helms et al. suggests as much in col. 3 line 1" and that Helms' design "would have received and maintained coolant gas because coolant gas was described as blown into the closed space (57) during processing (col.4 lines 35+)."

The rejection is respectfully traversed. First, the disclosure of Helms does not anticipate Applicants' claimed invention, as is required to support a § 102(b) rejection.

Helms does not anticipate Applicants' claimed method because it fails to disclose, *inter alia*, the claimed feature of "cooling the chuck by communicating the gaseous coolant through the hollow shaft to the coolant chamber"

The Office Action relies upon the "embodiment represented in Fig. 4 of Helms and described in detail in col. 4 lines 13+." At col. 4, lines 21-22, Helms discloses in pertinent part that "[t]he substrate holder 53 consists of the watercooled substrate holder 44" Thus, Helms employs water to cool the substrate holder, not Applicants' claimed gaseous coolant.

The Office Action asserts that "[i]t is unclear if the cooling medium is limited to only a liquid." In view of Helms' disclosure of "the watercooled substrate holder 44,"

however, Applicants respectfully disagree. Specifically disclosing water as a coolant teaches away from using another medium, such as Applicants' claimed gaseous coolant.

Similarly, Helms fails to disclose Applicants' claimed feature of "maintaining gaseous coolant in the coolant chamber." While Applicant firmly believes that these two steps alone—namely the "communicating the gaseous coolant through the hollow shaft," and "maintaining the gaseous coolant in the coolant chamber,"—distinguish the current invention from the prior art, Applicant has added a new step of "expelling the gaseous coolant through said slots." This step is clearly not disclosed by the cited references, and therefore should place the claims in immediate condition for allowance by the examiner.

The Office Action relies on Helms' description of Fig. 4, which states that "helium or another suitable gas is blown into the space 57 thus closed during the processing of the substrate 8 so as to increase the thermal conductivity between the substrate 8 and the support plate 44." Helms provides no description, however, as to how or with what structural features the gas is "blown" into "the space," nor does Helms provide a description of "the space" or disclose whether the gas is maintained there throughout the etching process.

Further analysis of Helms' Fig. 4 reveals that pipelines 70 and 71 are coolant inlet lines and that pipeline 69 is a coolant outlet line (by virtue of the directional arrows). Since the "coolant passages 63, 64, 65, in the interior of the hollow shaft 45 . . . are connected by annular passages to the pipelines 69, 70 and 71," the coolant must flow into the hollow shaft through pipelines 70 and 71, and *out* of the hollow shaft through pipeline 69. In Applicants' claimed method, however, the gaseous coolant flows only through the hollow shaft *to* the coolant chamber. The coolant gas is maintained there during the etching process and expelled through slots in the face of the chuck. Thus, Helms does not anticipate Applicants' claimed invention.

Similarly, Helms' fails to disclose Applicants' claimed feature disclosed in claims 13, 16 and 26 of a vertically movable, central hollow shaft "for communicating a gaseous coolant," and as disclosed in claim 16, for "pushing the spider system to move the wafer away from the chuck in response to actuation of the lift actuator."

Reference to Helms' description of Fig. 4 reveals "three lifters 40, 40', and 40", which are driven by an electric motor," and that "[A]fter the loading and unloading arm 7 has entered, the cage 47 is lowered . . . by lowering the three lifting devices." (See col. 4 lines 16-17 and 48-50). Thus, the entire "cage is raised to the 'high' position by extending the three lifting devices." (See col. 4 lines 40-41). Helms' system does not disclose the

the three lifting devices." (See col. 4 lines 40-41). Helms' system does not disclose the Applicant's claimed invention which employs vertical movement of the central hollow shaft. The hollow shaft 45, disclosed by Helms and relied on in the Office Action, does not "communicate a gaseous coolant" nor is it capable of vertical movement for wafer displacement. Wafer displacement in Helms' system involves an electric motor generating movement of a "cage" and entry of a "loading and unloading arm." Thus, Helms does not anticipate Applicants' claimed invention.

The Helms reference does not teach or suggest all the limitations of the claimed invention as required to support a *prima facie* case of obviousness. Furthermore, the claimed invention would not have been obvious because there is no suggestion or motivation, either in Helms or in the knowledge generally available to one of ordinary skill in the art, to modify the reference teachings to attain the claimed invention.

Claims 13 and 16 depend directly from claim 10. Accordingly, for at least the above reasons, reconsideration and withdrawal of the rejection of claims 13 and 16 under 35 U.S.C. § 103(a) is respectfully requested.

35 U.S.C. § 103(a) – Helms further in view of Saeki and Nozawa

Claims 14 and 15 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Helms, and further in view of U.S. Patent No. 5,460,684 to Saeki et al. (Saeki) and U.S. Patent No. 5,290,381 to Nozawa et al. (Nozawa).

For all of the reasons indicated above with respect to the rejections over Helms under §§ 102(b) and 103(a), the rejection is respectfully traversed. The claimed invention would not have been obvious because there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings to attain the claimed invention. Claims 14 and 15 depend directly from claim 10, and the references cited do not teach or suggest all of the claim limitations of the independent claim 10 as required to support a *prima facie* case of obviousness. Regardless of what Saeki and Nozawa may teach with regard to the use of an electrostatic chuck and the optimization of process parameters, the asserted combination is deficient for all of the reasons articulated above with respect to the rejections over Helms under §§ 102(b) and 103(a).

For at least the above reasons, reconsideration and withdrawal of the rejection of claims 14 and 15 under § 103(a) are respectfully requested.

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In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

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